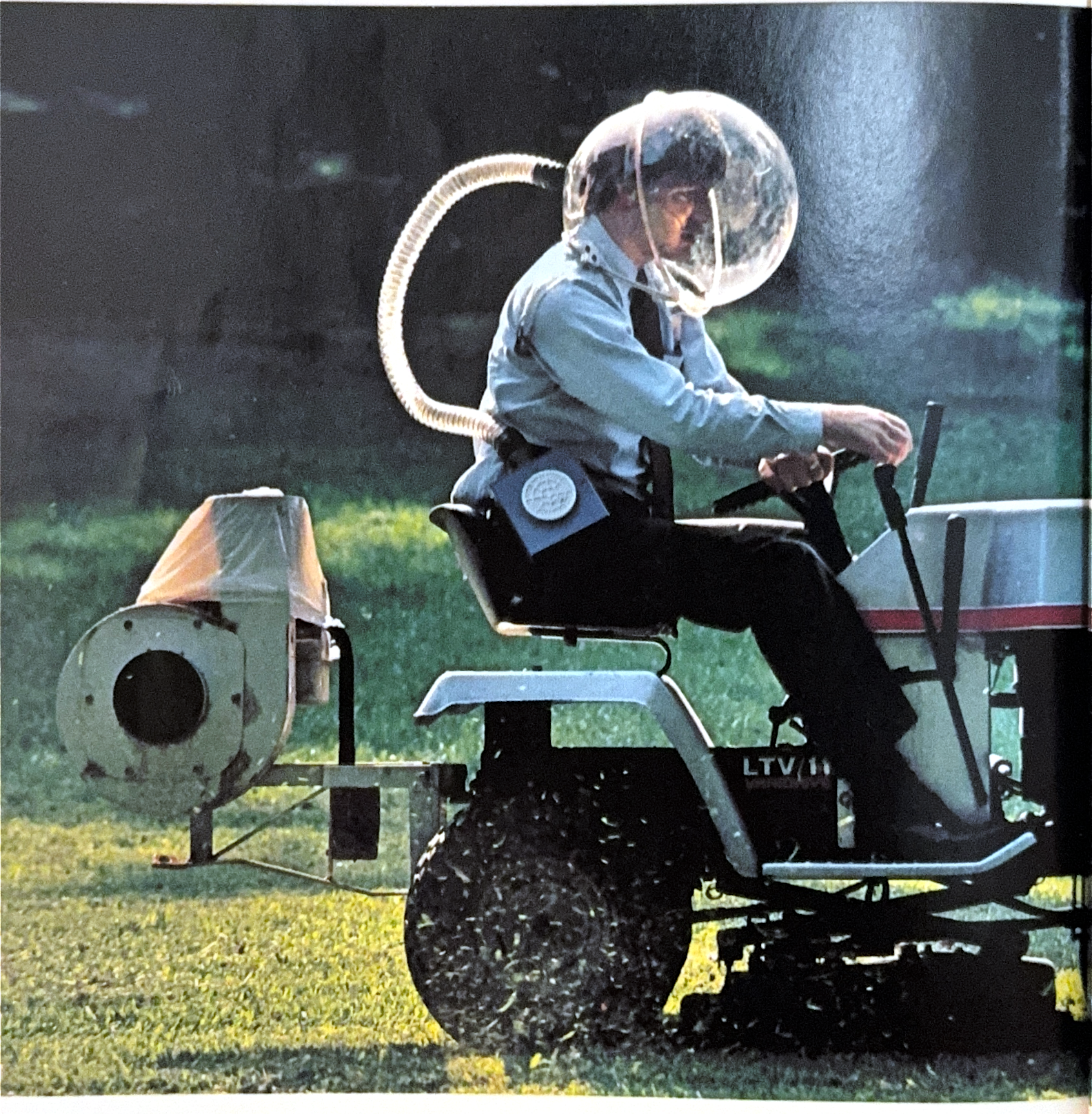
POLLEN



The perils of pollen—*sneezing, wheezing, and nose-twitching misery—are allegedly thwarted by the Hincherton Hayfever Helmet, which enables sufferer Jim Greenbaum to mow his Virginia lawn. Some 15 million Americans suffer from hay fever, but its cause, pollen, confers blessings as well. Bearing the male sex cells*

BREATH OF LIFE AND SNEEZES

By CATHY NEWMAN

NATIONAL GEOGRAPHIC STAFF

Photographs by

MARTHA COOPER

of flowering plants and conifers, these minuscule grains—sacred to the continuity of life—launch the formation of a seed.

ONLY TWO WEEKS after moving to the sunbaked brilliance of Tucson, Arizona, from the smog of Trenton, New Jersey, Bill Flynn sat in a doctor's office and . . . *twitch, sniffle, gasp* . . . *a CHOO!* Welcome to sneeze city. Flynn learned he could count on 21 pollens—from Arizona ash to Russian thistle—to provoke the misery he thought he'd left behind. For the next several years he faced regular allergy shots.

Flynn, a large man with an easy laugh, whose hay fever had marred his enjoyment of such simple outdoor pleasures as a pick-up game of softball, was dismayed:

"Before I moved here, I thought: It's like Lourdes. I'll walk off the plane and be cured. Don't believe it. There are grass and trees out here."

And hedges, weeds, and other veritable pollen factories, he might have added.

What happened to the healthy air? It was polluted by allergy refugees and other newcomers who sowed the seeds of their own discomfort by greening the desert.

As Flynn's allergist, Dr. Jacob Pinnas of the University of Arizona Health Sciences Center, explained, snowbirds addicted to their lawns had migrated here and refused to transfer their affections to native plants like creosote bush and cactus.

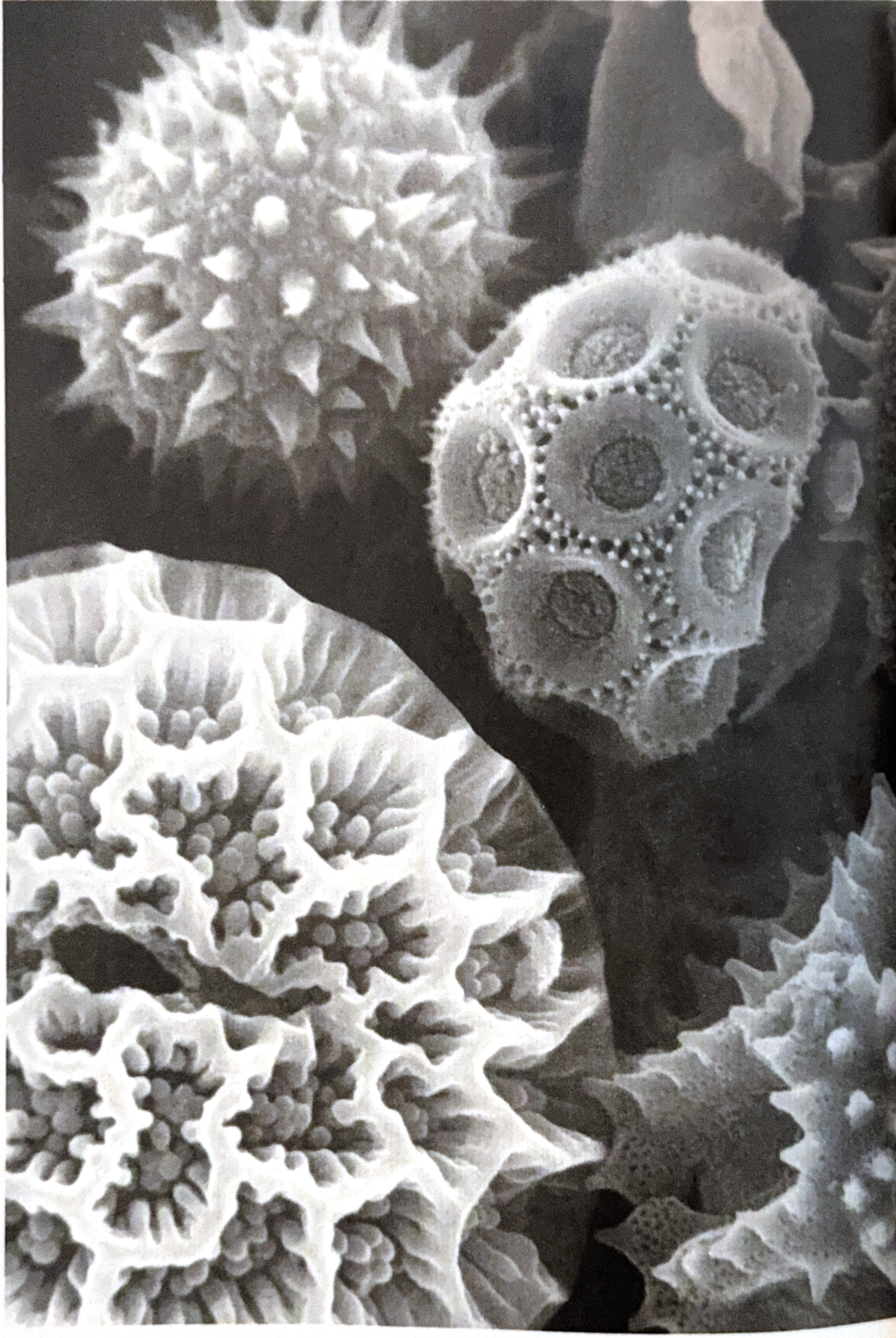
Instead, they had planted alien species—Bermuda grass and elm trees among others—and hoisted the pollen count to levels matching Milwaukee, Brooklyn, and Pittsburgh—places they had fled.

"People who moved here didn't think about pollen," Dr. Pinnas said. "They just wanted a lawn and a tree."

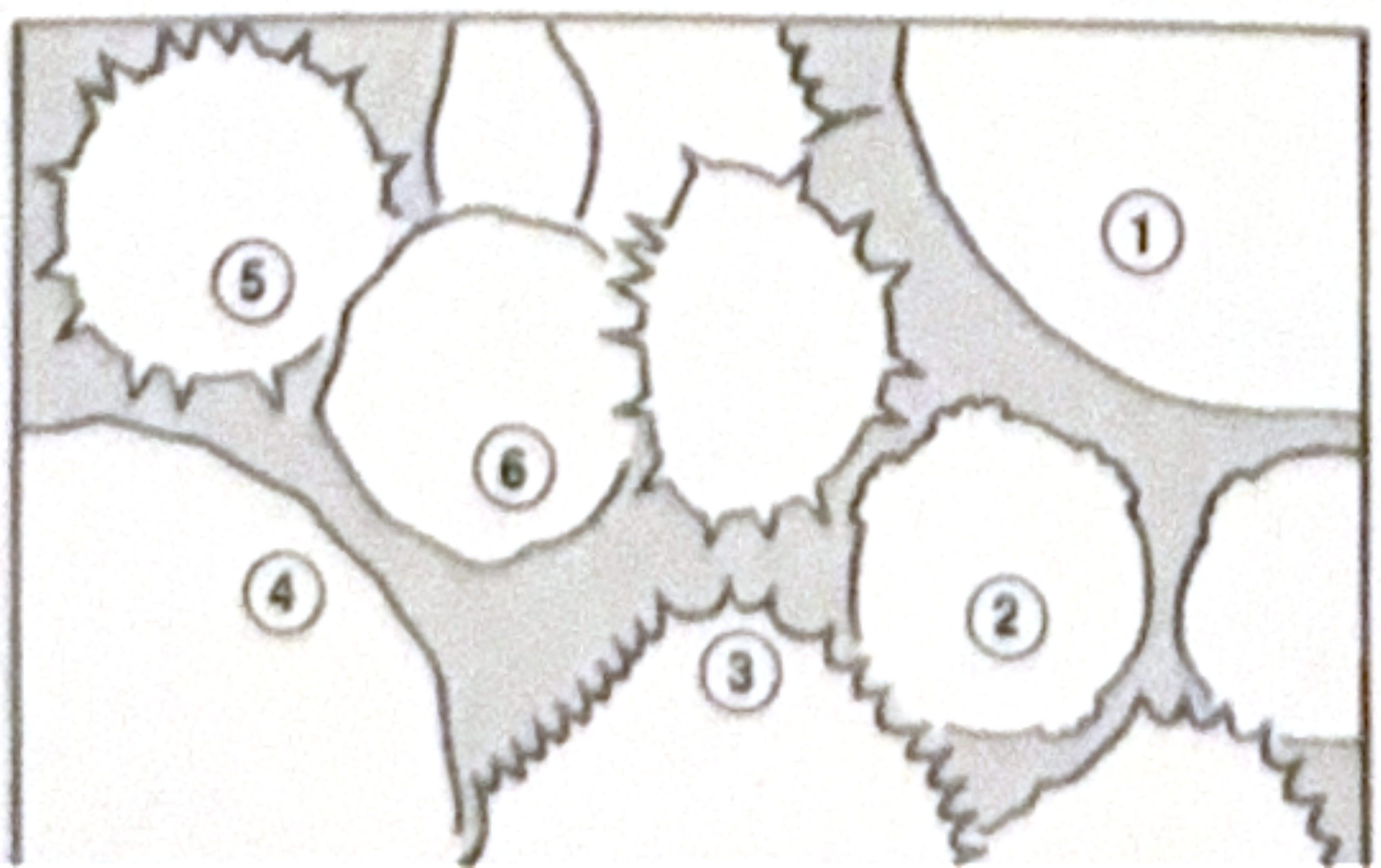
When the statistics were in, they got a jolt. The allergy prevalence in Tucson, where nearly a third of the population had moved for health-related reasons, had jumped to three times the national average. The allergy haven had become a Kleenex-littered hell.

If the mention of pollen brings tears to your eyes and wheezes to your lungs, as it does to some 15 million hay-fever-stricken Americans, let me point out that there is more here than meets the nose. Pollen means "dust" in Latin, but brush aside that fact for now and view pollen as a living cloud, cast to the winds by trees and grasses, descending on the

(Continued on page 496)

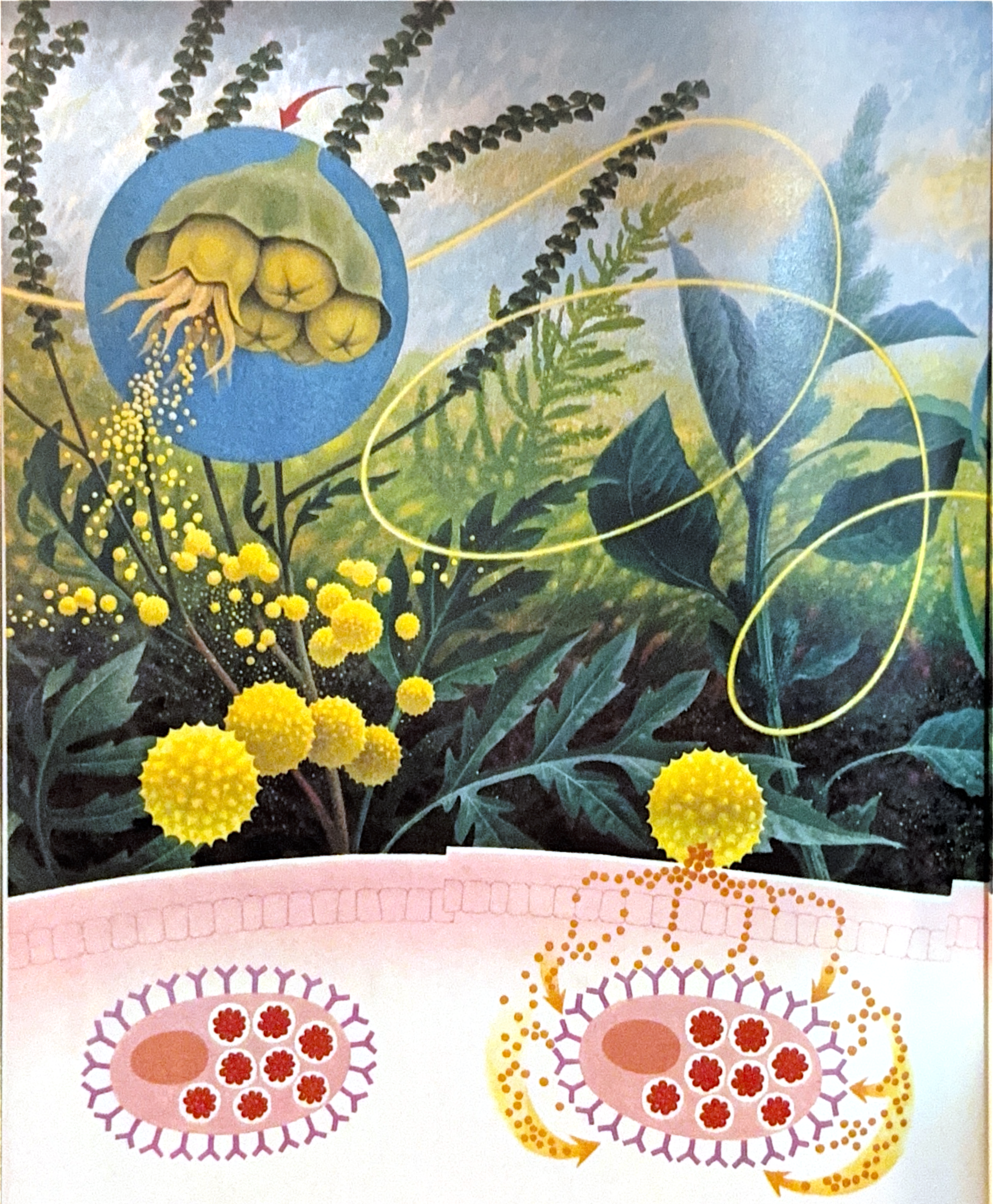


Mini-splendored things are grains of pollen magnified 3,000 times. Each is protected by the exine, a nearly indestructible wall. Subtle variations



MARTHA COOPER AND JOAN NOWICKE, SMITHSONIAN INSTITUTION

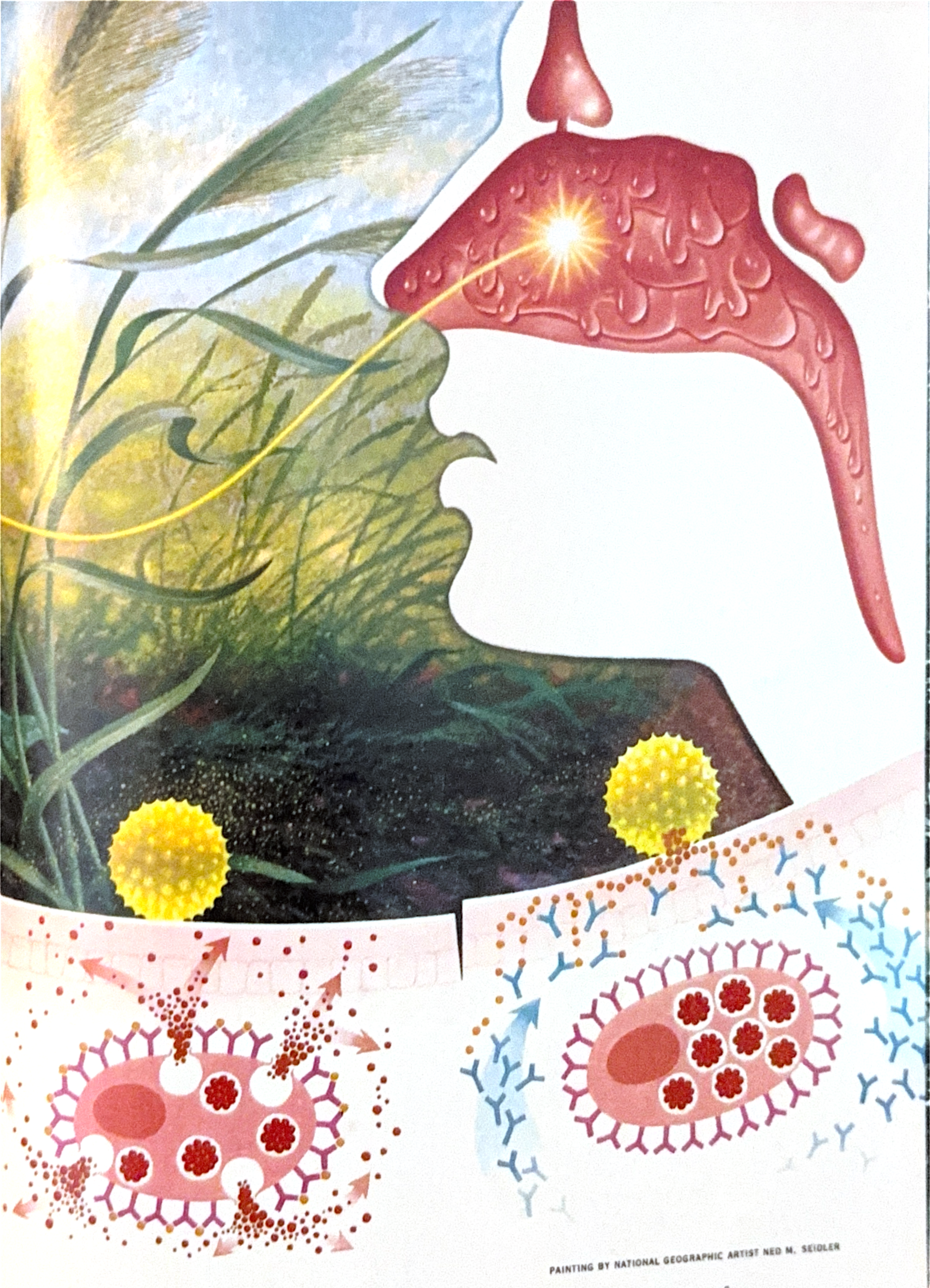
often make identification by plant species impossible, says the Smithsonian Institution's pollen expert, Dr. Joan Nowicke. So grains here are identified by family group: (1) phlox, (2) rooster comb, (3) chrysanthemum, (4) smartweed, (5) smartweed (a different species), (6) geranium.



ANATOMY OF A SNEEZE

*WHEN RAGWEED releases pollen, it floats through air to the nasal passages. Those primed for allergy by heredity start producing a Y-shaped molecule in the blood, known as immunoglobulin E (IgE), which attaches to mast cells lining the respiratory tract (**above**).*

On subsequent exposure to ragweed pollen, a protein (yellow dots)—the offending factor in the pollen—leaches out of the grain and binds closely aligned IgE molecules on the mast cell. The body's response to the pollen invasion is under way.



PAINTING BY NATIONAL GEOGRAPHIC ARTIST NED M. SEIDLER

The linkage of the IgE molecules sparks a tiny explosion in the mast cell. Various chemical mediators (red dots), including histamine, leukotrienes, and prostaglandins, leak from the cell. These chemicals cause the symptoms of allergy, like sneezing, congestion, itching.

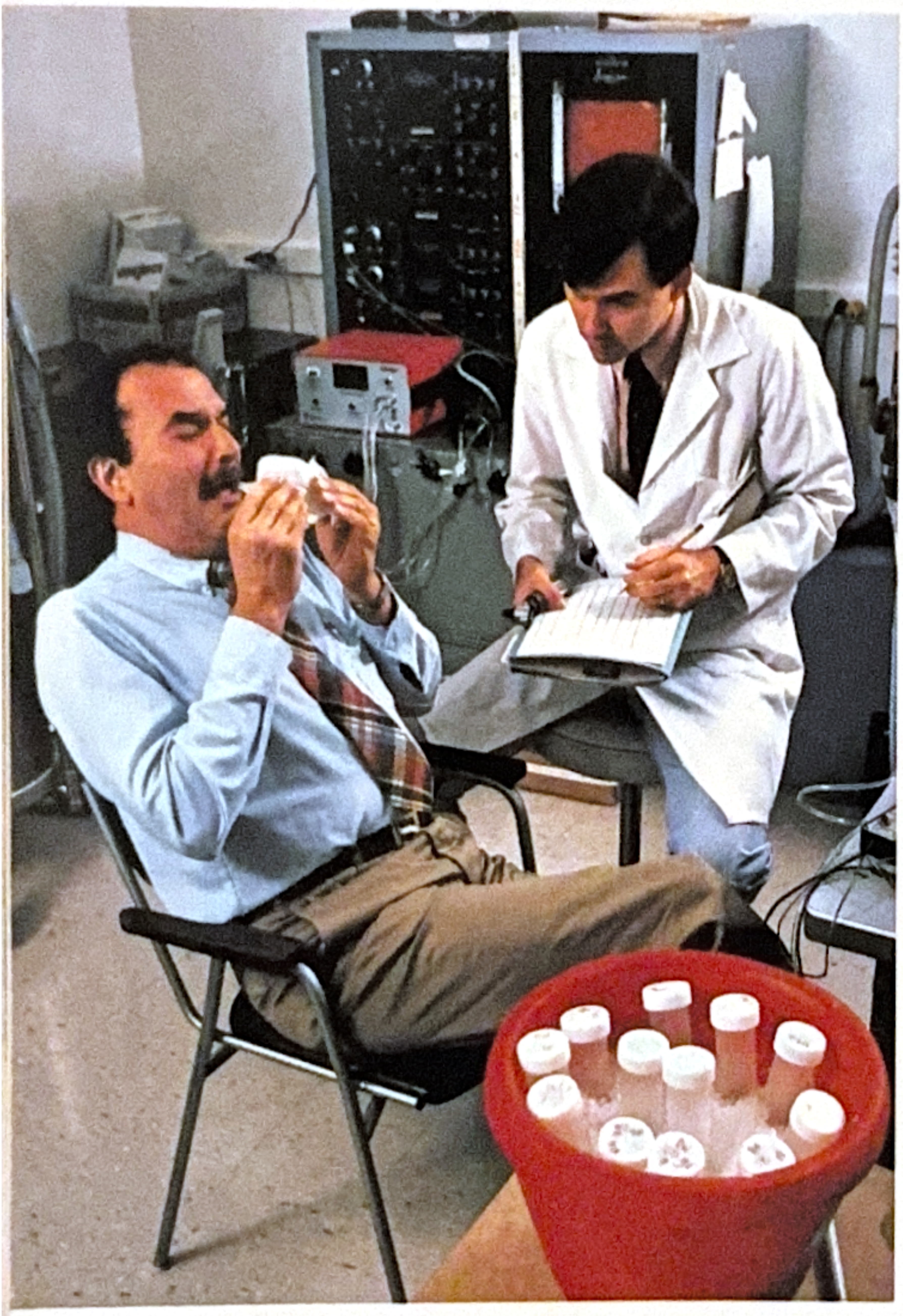
If an individual has taken a series of allergy shots—increasing dosages of the specific allergen—the body builds up an antibody known as immunoglobulin G (blue), an allergy-countering factor. But for unknown reasons, immunotherapy seems to work only 80 percent of the time.

fragrant blooms of glittering cities and desolate deserts.

Pollen is to plants what sperm is to animals: the agent of viability. It is the breath of life as well as of sneezes.

It also tickles human experience in important, fascinating, even offbeat ways.

In the past year my pollen prospecting has led me to a murder in Vienna, where pollen provided the most critical clue; to a Navajo medicine man's hogan, where pollen blessed a man suffering from pneumonia; to Texas oil fields, pinpointed in part by fossil pollen; and to an athletic field in Finland, where Olympic runners who used pollen in their diet lapped the competition.



Conducting a nasal appraisal, *Dr. Peter Creticos of the Johns Hopkins University records a patient's reaction to a challenge test* **(above)***, whereby pollen grains, blown up the nasal cavity in increasing dosages, determine sensitivity to an allergen. At the slightest hint of a breeze, nonallergenic pine pollen smokes from a tree* **(facing page)** *in Oregon's Crater Lake National Park.*

IN *PARIS* I peered through a microscope at a 50,000-year-old pollen grain from the grave site of Neanderthal man.

"Senecio, a type of yellow daisy. It blooms now on the hills of Iraq," speculated Dr. Arlette Leroi-Gourhan, director of the Musée de l'Homme's palynological laboratory.

The grain comes from soil samples sent to her by noted anthropologist Ralph Solecki, who unearthed several Neanderthal grave sites in Shanidar Cave, Iraq, 25 years ago.

Hoping to determine the prevalent flora, and thus climate, during the time of these early humans, Dr. Leroi-Gourhan searched for pollen. Samples from soil beneath the skeletons yielded a stunning discovery.

"I was stupefied. They were so rich in pollens. But not just pollens. Bits of wood. Even a butterfly wing scale," she said.

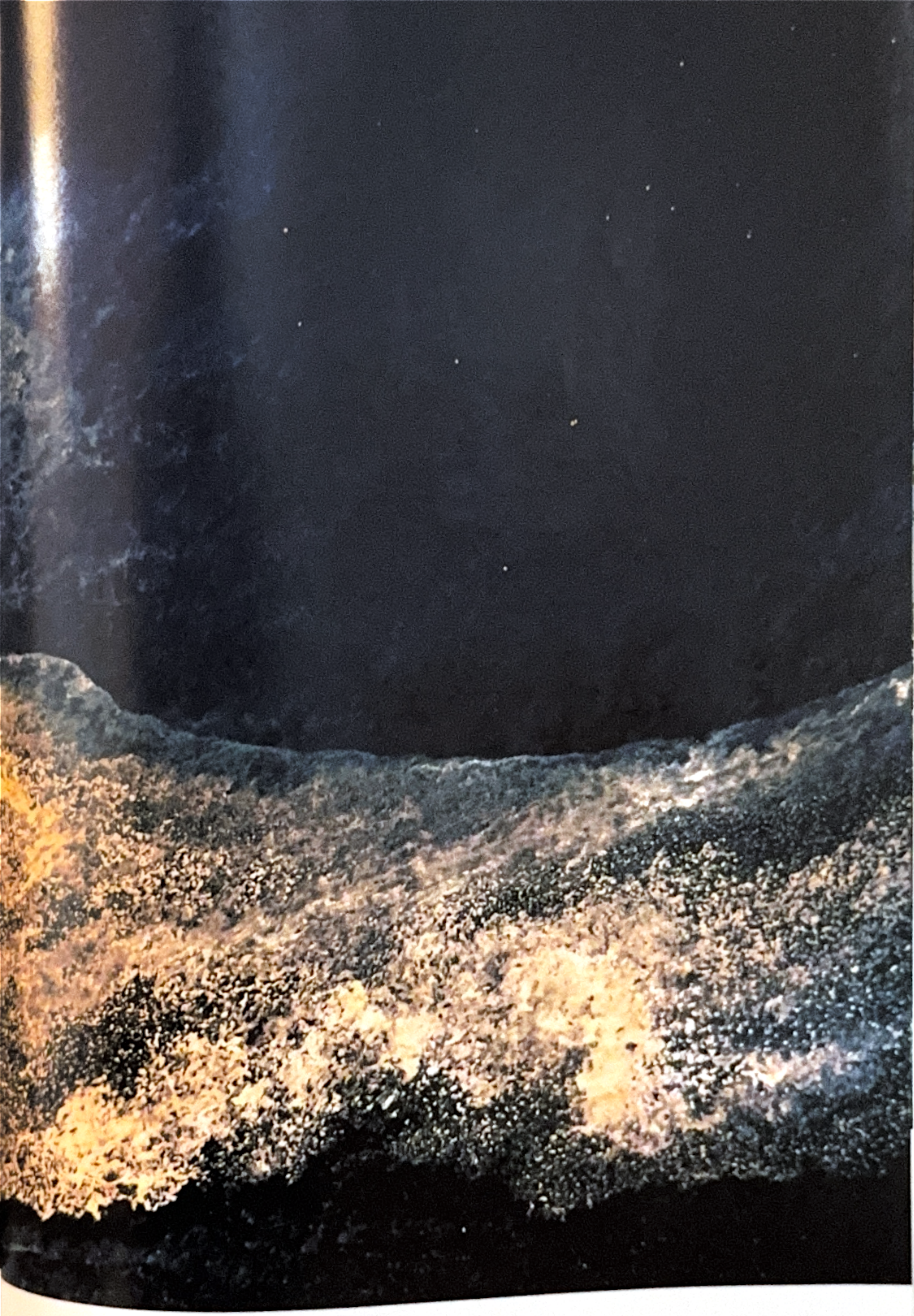
The pollens were from ornamental flowers—hollyhocks, grape hyacinths, and others. She also identified pollen from *Ephedra,* a many-branched shrub with tiny scalelike leaves. There was little chance that these had been blown far back into the cave by winds or tracked that far in by animals. No, the flowers had been placed there by mourners. And the *Ephedra* pollen proves, Dr. Leroi-Gourhan feels, that the dead had been placed on a bier of branches. The burial took place in late May or in June, she estimates.

The tiniest of clues had revealed a new dimension of cave-dwelling Neanderthal man. He grieved.

We don't know if he suffered allergies. Hay fever doesn't mark bones, as do arthritis and some other diseases. Many doctors feel that the rise of civilization and allergies paralleled each other. Others say today's abundance of allergies merely reflects medicine's improved ability to diagnose.

But allergy and anthropology are secondary roles in the life of pollen. It quickens the ovule of flowers and so forms a seed. Touched by pollen, trees and bushes respond with huckleberries or hazelnuts or pears. Pollen fertilizes the tree of life.

Amber waves of pollen, *some nearly half a mile wide, gild Crater Lake during summer when surrounding forests pollinate. A small percentage of the world's plants, generally trees and grasses, are wind pollinated and shed*



tremendous amounts. A single pine tree may produce more than 320 billion pollen grains over a 50-year span.

Buoyant and winged, such pollens are sometimes dispersed thousands of miles from their point of origin.

Though the Assyrians recognized the sexuality of plants and Pliny called pollen the material of fertilization, it was not until the development of the microscope in the 17th century that man could actually see individual grains. The English microscopist Nehemiah Grew, one of the first to describe them, colorfully characterized their shapes as miniature peppercorns, Holland cheeses, and fish.

You need a microscope to really study pollen, though you just might see a large grain, like that of corn, with the naked eye if you knew it was there and squinted. Not so a forget-me-not pollen grain. You could fit nearly 10,000 of them on a pinhead. Pollen grains are so tiny and uniform they have been used to calibrate precision instruments that measure in thousandths of an inch.

IF NOT FOR the more than a quarter of a million plants that reproduce through pollination, about the only produce sold in supermarkets would be plants that can reproduce asexually, by spore formation or underground stems called rhizomes.

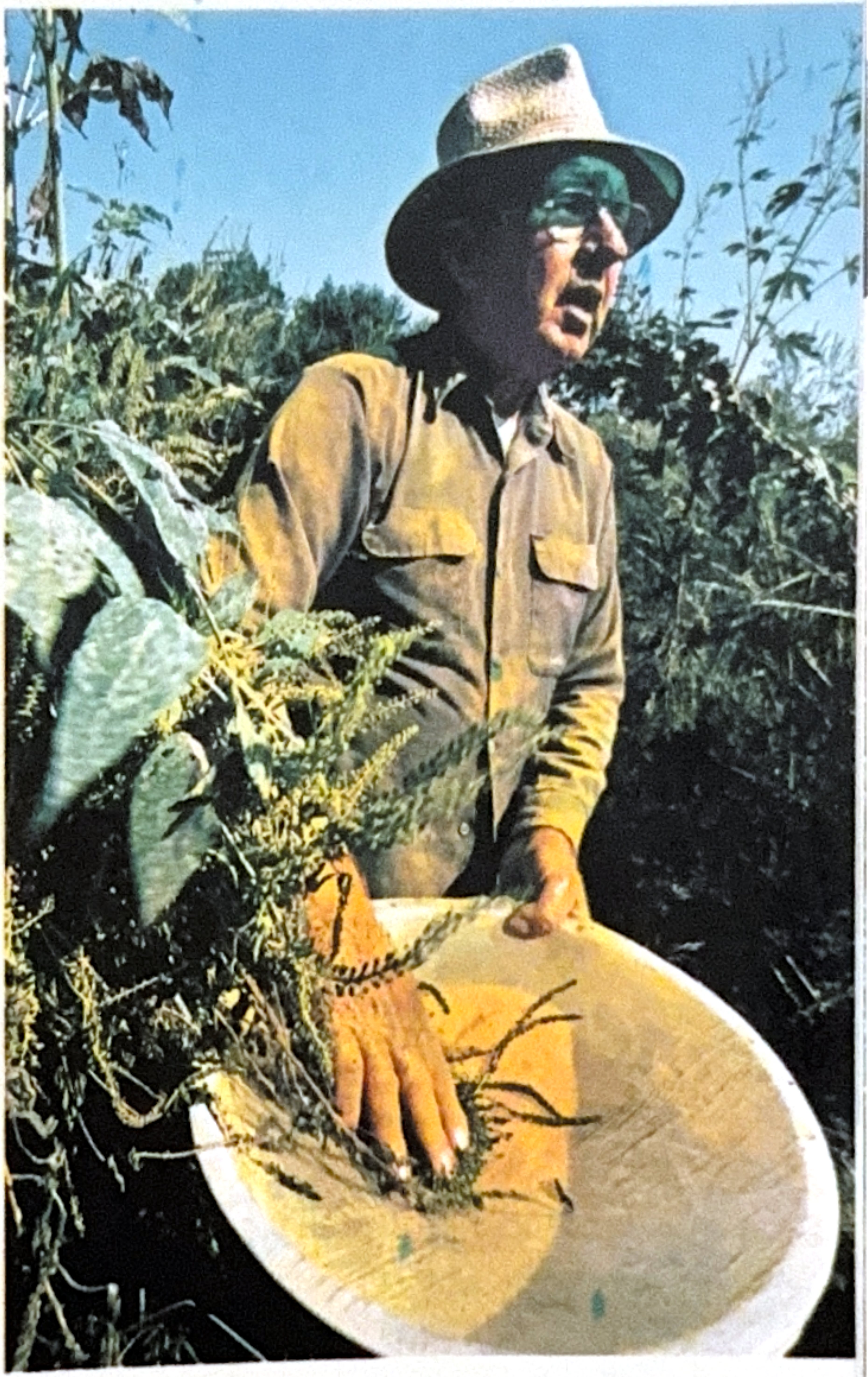
That means we would be limited to potatoes, onions, bananas, and—assuming we developed a palate for such fare—lichens, mosses, seaweeds, and ferns. We would be deprived of paper, croissants, wooden chairs, cotton shirts, cigars, beer, and wine, since all depend on pollen-bearing plants.

When a pollen grain, produced in a sac called the anther, is launched and lands on the stigma of a flower of the same species, a recognition factor gives it the green light. (Thus a tomato pollen grain does not waste its time trying to germinate on an eggplant.) The grain extrudes a pollen tube that conducts two sperm to the ovule. The first one unites with the egg to form the actual plant embryo. The second helps form the endosperm, or food source and protective covering. How fast this happens depends on the species. Geraniums fertilize in a matter of hours. Orchids take months.

Many plants are pollinated by animals, such as bees, birds, or bats. But other plants, mostly grasses and trees, are wind pollinated and shed whopping amounts. Much of Sweden, for example, is covered by conifers. By one estimate, if that country's pollen production were evenly spread, it would cover every Swedish square meter with 300 million grains.

Most of the pollen wafted into the air never finds its target. It may travel two feet or 2,000 miles and settle into the soil, immortalized in the fossil pollen record.

Embedded in earth the pollen's nearly indestructible shell, called the exine, endures epochs of continental drift, the advance and retreat of ice sheets, the formation of seas,



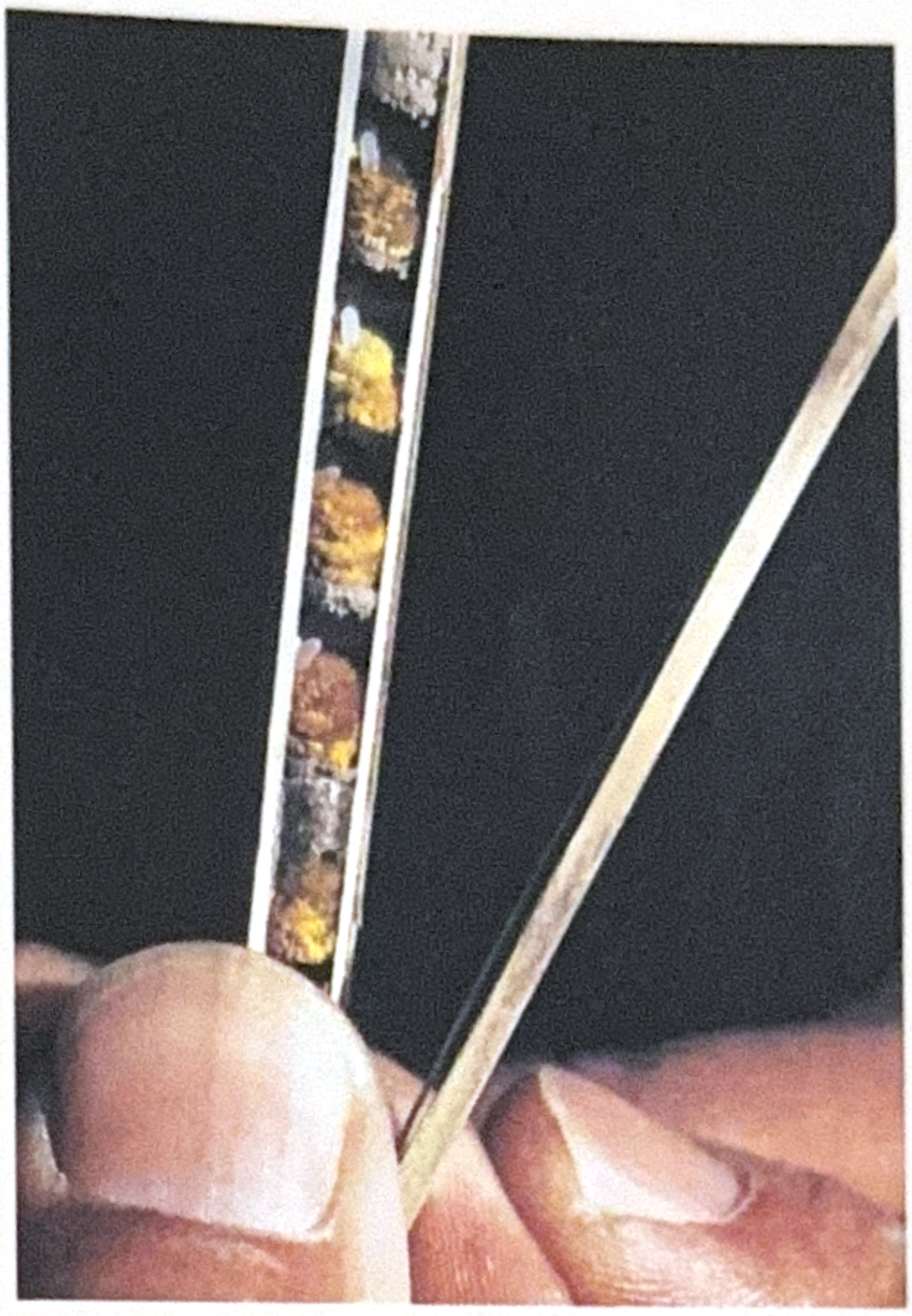
Blossoms shower *from an almond tree* ***(facing page)*** *in an orchard near Manteca, California. After separation from flowers, the pollen is sold to pollinate orchards where bees may have been killed by pesticides. Ragweed pollen is harvested by Willie Parsons* ***(above)*** *for Greer Laboratories in Lenoir, North Carolina, producers of allergy extracts.*

the rise and fall of mountain ranges. That is why pollen experts, called palynologists, can find ancient fossil grains, some nearly 300 million years old and their viability long gone, in corings from such locales as Antarctic ice, ocean beds, bogs, or deserts.

Once a coring from ocean bed or bog is retrieved, the sediment is boiled in a series of acids to separate out the pollen. The palynologist can then identify and count the grains. To define flora is to define climate, and so a thin slice of pollen-filled earth may represent a landscape scenario millions of years old.

IF COUNTING GRAINS one by one through a microscope sounds tedious, it is. "It's like looking through the end of a Coke bottle for hours," Vaughn Bryant, professor of anthropology at Texas A&M told me (page 507). "And if you don't wear glasses by the time you're 40, maybe you haven't been working hard enough."

As we stood under a ledge that provided respite from a broiling sun in Seminole Canyon, near Del Rio, Texas, Dr. Bryant kicked aside a few clods. But they were not just ordinary clumps of dirt. They were coprolites, an innocuous, if fancy, name for fossilized



***A light dusting** of pollen with a goose-down-tipped stick (**left**) promotes fertilization of pear trees in Japan, where pesticide overuse has decimated natural pollinators such as bees. During the blooming period, farmers enlist the aid of family, friends, and schoolchildren. As an alternate solution, some farmers have introduced colonies of horn-faced mason bees (**above**), efficient pollinators cultivated in reeds. Female bees stuff the reeds with nourishing pollen pellets, lay an egg on each, and intersperse the cells with mud.*

feces. By extracting the pollen from these remains, Bryant has reconstructed the diet of prehistoric man who lived in this canyon 9,000 years ago. The menu? Cactus, agave, sotol (a plant with spiked leaves), and mesquite flowers and seedpods, among others.

The tales told by pollen enhance our knowledge of man's history, and even of the world before man, in some fascinating ways. Consider:

- A specialist on pollen found in honey can decipher the Viking recipe for mead by identifying pollen scraped from the bottom of drinking horns.
- Pollen analysis has pinpointed the beginnings of agriculture in Ontario and Denmark. (The pollen profile shows a reduction in tree pollen, indicating land clearing, and a subsequent rise in the pollen of cereal grains and pasture grasses.)
- Scraped from the floors of ancient pueblos in the Southwest, corn or grain pollen can indicate whether a room was used for food storage and cooking.

"Archaeologists concentrate on cultural materials: pottery, grinding stones, and flints," Dr. Bryant said. "But these grains pack as much information in them." In the annals of early man, pollen helps illuminate chapters in the dark struggle for survival.

CAN A GRAIN OF POLLEN convict a man of murder? I open my case by presenting the evidence: a missing man presumed dead and a pair of leather boots belonging to the suspect.

The place is Vienna, Austria, the year 1959, and police interrogate a suspect, a young man who hotly declares his innocence. He claims that at the time of the murder he had been climbing a steep, sandy mountain.

The boots are given to a palynologist with the geological survey, Dr. Wilhelm Klaus.

He carefully scrapes them. But the suspect has cleaned them well. Less than a gram of dirt remains.

It contains 1,200 pollen grains.

They include spruce, willow, a plant called *Filipendula,* and a 20-million-year-old hickory grain. They speak not of high, dry land, but of a river basin, and because of the ancient hickory grain, a specific swampy outcrop, 20 kilometers north of Vienna.

"We confronted the suspect," Dr. Klaus, now professor of paleobotany at the University of Vienna, recalled. "'You lied,' we said. 'You were really near the Danube.'" Shocked, the man confessed. He led police to the scene pinpointed by pollen. In a shallow grave—in damp ground—police uncovered the body of the murdered man.

The late Max Frei, a noted Zurich criminalist, specialized in cases that hinged on such minutiae. Consider a few definitive pollen clues from his casebook:

- Hazel and birch pollen on a newly greased gun barrel refuted the murderer's alibi that the pistol had remained unused since the previous March.
- A grain of Atlantic cedar pollen embedded in the ink of a signed, dated document proved it a forgery, written in October, and not in June as claimed.
- Pollen from the body of a murdered woman did not correspond with the area in Sweden where the body had been found. Thus, the murder had been committed elsewhere.

Frei's work included cases like the kidnapping of former Italian Prime Minister Aldo Moro. When Frei died last year, he was pursuing a more baffling intellectual puzzle:

To ***build a better tree,*** *plant geneticists bag the maturing cones of one of 200 select Douglas firs* ***(left)*** *in California's Shasta-Trinity National Forest as part of the United States Forest Service's Superior Tree Program. The bags prevent random fertilization from surrounding trees. When the cones are ready, pollen from another superior tree is introduced by geneticist Chuck Frank* ***(right)****. The seeds are collected in the fall and will produce higher-yielding, faster-growing trees.*

the Shroud of Turin, the cloth that some believe wrapped the body of Christ. Frei's scrutiny of the shroud in the 1970s yielded 56 pollens—some of them from plants found in Anatolia and Palestine—which suggested to him that at some time the cloth had been in these lands. The findings sparked controversy; after all, some palynologists argued, the pollens could have resulted from contamination.

And so the shroud remains a mystery. Evidence inconclusive. Case unsolved.*

TEXAS, a state that likes to brag of bests, biggests, and mosts, can add this claim to the list: Big, frenetic Houston boasts more industrial palynologists than any other U. S. city. Naturally. It's the vortex of the oil business, a major employer of pollen specialists. On the soggy August day of my visit, the oil industry limped. I clicked on the radio. Spot crude had dropped a dollar. I turned on the TV. The Texas rig count was down 11 from the previous week. But rigs were still pumping; the world was still trading. And in Exxon's laboratories, senior research associate Lew Stover was examining several of the more than 15,000 slides his laboratory processes each year from drill-core samples sent in from rigs worldwide.

Palynology, Stover explained, can help indicate where and how deep to drill. Fossil pollens and spores act like a dipstick and locate the drill bit geologically. Such knowledge can help make the difference between a well that makes money and one that doesn't. That's why some 170 palynologists work in the energy field in the United States and Canada. Exxon alone employs 25.

"Take Sumatra, Borneo, Malaysia," Stover said. "If you're exploring there, you look for a prehistoric mangrove environment. That means pollens from mangroves, palms, and such. In Korea, though, you look for temperate species, oak and willow, in sediment as old as 25 million years.

"It's detective work on the grandest scale," he continued. "People regard oil exploration as static. It's not. Think of mountains uplifting, seas drying up, plants evolving. What could be more grand?"

Later that day, imprisoned in a Texas-size traffic snarl and the fumes from all those hydrocarbon-fueled engines, I wondered just how grand the end result was. I leave that one to the urban philosophers.

A FRIEND, a confirmed jogger, mentioned that he ate four pollen tablets a day. "For fitness," he said.

Is pollen the breakfast of champions? Olympic sprinter Steve Riddick, who sported a "Bee Power" T-shirt after winning the gold in the 400-meter relays in 1976, thinks so. So does world-class marathoner Gary Fanelli, who takes ten pollen tablets before a race and often pops one while running.

---

*Kenneth F. Weaver wrote of "The Mystery of the Shroud" in the June 1980 NATIONAL GEOGRAPHIC.

Such health-food products contain bee-gathered pollen. To collect it, beekeepers place a trap at the entrance to the hive. A wire screen (page 510) scrapes the two pollen pellets carried on the bee's hind legs into a collection drawer beneath the hive.

The collected pollen is pressed into tablets or sold loose, but some companies add a binder of honey and concoct pollen bars—said to be a favorite of Ronald Reagan. The President would, a White House spokesman assured me, "keep a supply on hand if he knew where to get some."

Well, I sent several pollen bars along to the President, but despite my inquiries, I never did find out if they replaced jelly beans as the presidential snack.

POLLEN POWER: Is it all fact or fad? A track coach reminds me that races are won in splinters of a second. If there is a pill that promises a legal physical advantage, you can bet any athlete worth his salt tablet will glom on to it.

During the 1970s the Finnish Olympic track team, including distance runner Lasse Virén, who won two gold medals in 1972 and two in 1976, took pollen supplements at the request of head coach Seppo Nuuttila. Nuuttila now coaches the Olympic rowing team, for whom he recommends pollen. He feels it's an effective supplement, high in B vitamins.

At Louisiana State University in Baton Rouge, I proffered pollen to Ralph Steben, assistant professor of physical education.

He tried some and frowned. "It doesn't taste very good," he said.

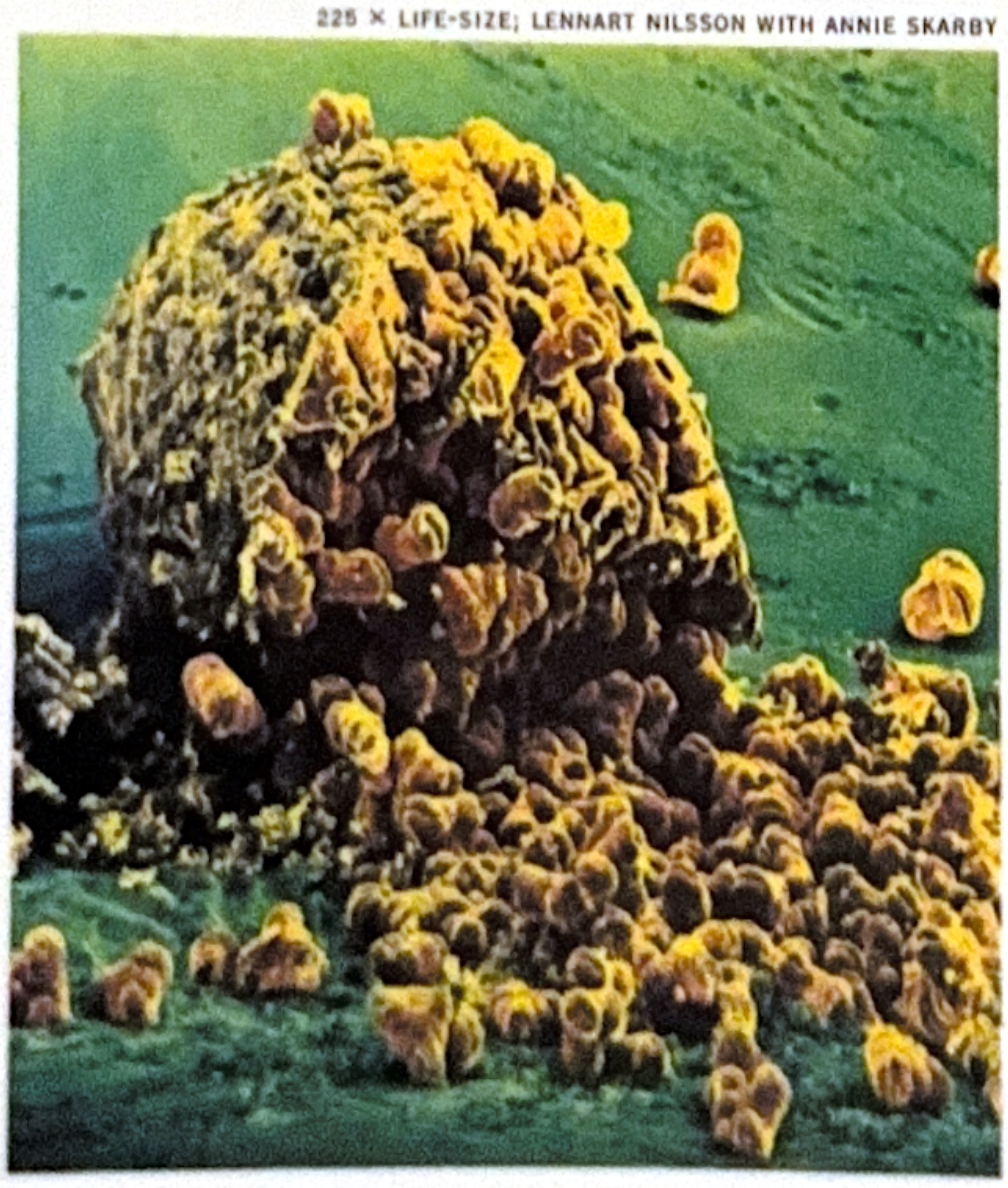
As far as I know, Steben has done the only controlled studies in this country involving athletes' use of pollen. His three experiments involved weight lifters, swimmers, and cross-country runners.

"It really doesn't help," he told me. "It's subjective, though. If an athlete thinks he's going to perform better, maybe he will."

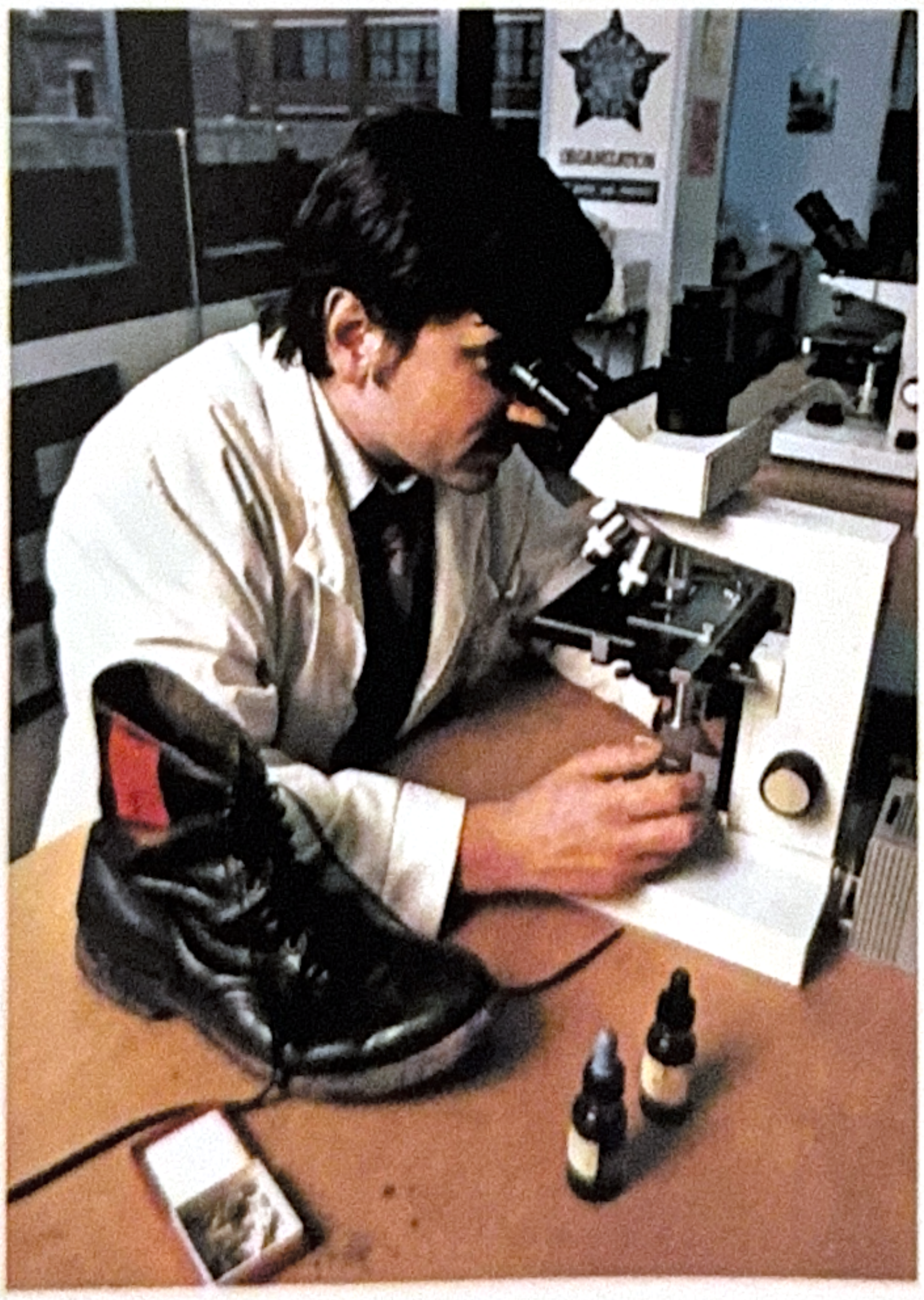
Perhaps the most devout believer in pollen I met was Jim Devlin, a former Catholic priest who converted to pollen several years after leaving the clergy. Now he spends his

To see the world in a grain of pollen *is the work of experts like Dr. Vaughn Bryant* ***(facing page)*** *of Texas A&M University, whose assortment of plants duplicates the diet of Indians who lived in the Texas desert 9,000 years ago. Clues for the reconstruction of the larder were supplied by pollen found in coprolites, or ancient feces* ***(above)****. Pollen provides a wealth of information to scientists, who can reconstruct ancient vegetation and climatic conditions by analyzing fossil pollen found in core samples. Pollen grains 78 million years old spill from a broken anther, or pollen sac* ***(below)****, found in Sweden.*

225 × LIFE-SIZE; LENNART NILSSON WITH ANNIE SKARBY



***Sleuthing for oil** at Exxon's research laboratory in Houston entails examining fossil pollens in core samples and scrutinizing photographs to identify types (**above**). Certain pollens help indicate whether conditions favored the formation of oil, assisting scientists in pinpointing promising drill sites. A microscopist in training at the Chicago Police Department Crime Lab studies soil from a boot (**below**) for pollens that may yield crime-solving clues.*



time on the road, doing the radio-TV talk-show circuit in praise of pollen, which he sells. To Devlin, pollen is manna. Literally.

"Do you know what the Bible says about manna?" he asked me. "It says it tasted like honey wafers."

As we drove to his home in the hills above Prescott, Arizona, Devlin related how he discovered pollen.

"I was 45, sickly, overweight . . . ," the story began.

In short, Devlin, a 212-pound weakling, first bought pollen from a beekeeper at a flea market. It transformed his life, he said. He lost weight, gained energy, looked younger.

"It's also done wonders for my virility," he added.

I edged slightly closer to the car door.

Like other pollen evangelists I met, Devlin claimed that pollen acts as a health restorative and preventive medicine.

"Those Russians who live to be 125," Devlin told me. "They're beekeepers. They eat pollen."

How did he know?

He handed me a study conducted in Bulgaria and a clipping from a screaming-headline tabloid.

"If pollen is so good for you," I asked, "why isn't it selling like aspirin?"

"The medical profession," he replied. "They're afraid of losing business.

"You can't expect miracles with it," Devlin told me. "Remember it's a food, not a medicine." When I last saw him, he was on the phone arranging another appearance.

IN ENGELHOLM, SWEDEN, the Cernelle Company has been making pollen-extract products since 1952. Cernelle manufactures a pollen toothpaste, pollen face cream, pollen animal feed, and a score of other such concoctions.

I watched a machine stamp out tablets at the rate of 80,000 an hour. Business is as healthy as the pollen purports to be. Last year sales totaled 2.5 million dollars, a 50 percent increase over the previous year. To make 140 million tablets, the company harvested some twenty tons of pollen from surrounding fields.

Twenty tons? How? I asked Cernelle Chairman Åke Asplund and several of his executives.

The men averted their eyes. I felt as though I had picked up the wrong fork at a state dinner.

"It's very secret. We don't talk about it," Asplund said.

Later someone muttered something about a machine that operated on electrostatic principles, but no one offered any details.

Cernelle's pollen tablets are licensed as a drug in eight countries, including France, Argentina, and Japan. But not in the United States. And not in Sweden.

"No one is a prophet in his own country," Asplund said. He looked sad.

"It's not like taking penicillin. The results aren't dramatic," Asplund added. "We do feel it's a healthy product. Don't forget, pollen does produce new life."

So who was I to pass up a chance at long life and good health? I tried the stuff myself for a month. But my squash game didn't improve. And I caught my usual winter cold. Perhaps a two-month trial would have rendered me invincible and immortal.

In this country the Food and Drug Administration sidesteps the pollen controversy. As long as the pollen is properly labeled and sold as a food, the FDA is satisfied.

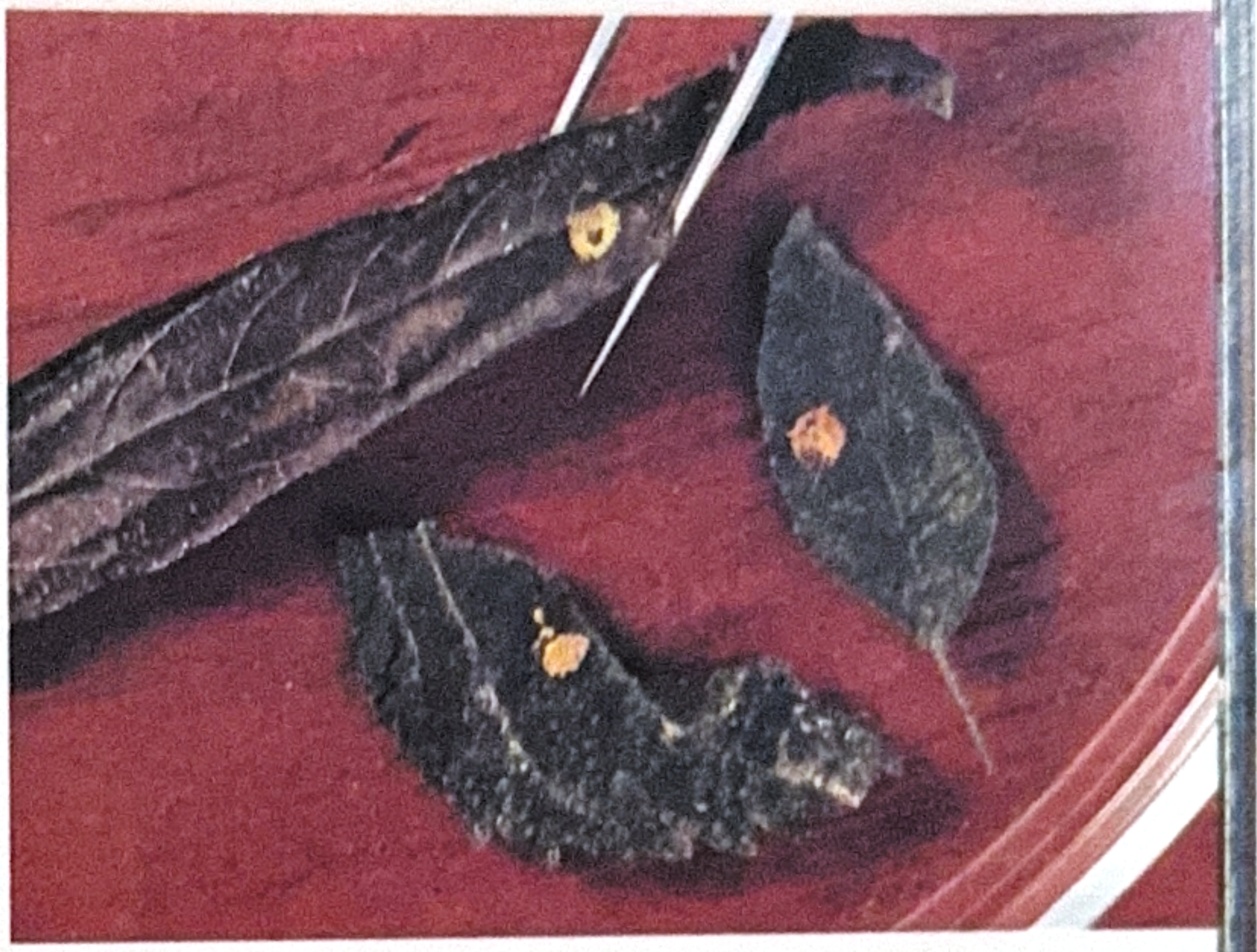
But in St. Louis, Missouri, Dr. Walter Lewis, professor of biology at Washington University and a noted authority on folk-plant remedies, regarded a bag of bee pollen skeptically.

"I think it's a scandal," he said. "I see nothing in pollen that is not in most plant cells from a nutritional point of view. Yes, it's rich in amino acids. But so is a handful of sunflower seeds."

Lewis points out that because of the allergenic properties of pollen, eating the stuff carries the slim, but real, chance of life-threatening acute reactions.

Whether fact or fad as health food, pollen's prime function remains unchallenged. It greens the world—and our lives.

IT IS EARLY FEBRUARY in blossom-studded orchards of California's San Joaquin Valley. In an almond grove near Manteca, alongside a dozen high-school kids, I am "knocking the trees," to gather almond pollen for supplemental pollination of orchards. It turns out to be more punishing for me than the trees.

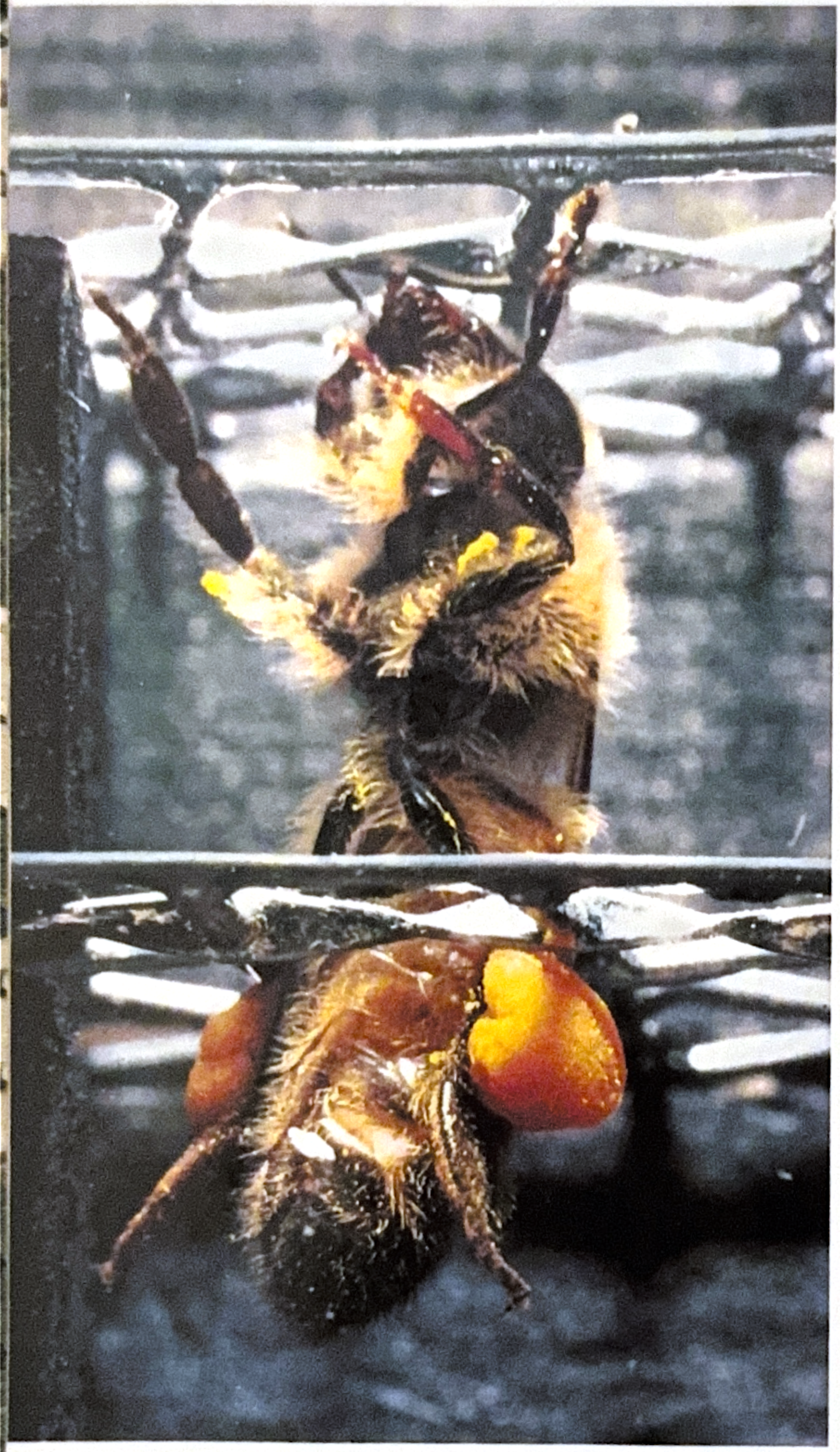


YELLOW RAIN

RAIN OF CONTROVERSY dots three leaves in the collection of Harvard biochemist Dr. Matthew Meselson. The top leaf, collected by Hmong tribesmen in Laos, is allegedly from the site of a chemical attack in March 1982. The two bottom leaves, found in India, are spotted with bee excrement.

Argument centers on charges by the U. S. government that the Soviet Union supplied toxins to allies who sprayed deadly yellow rain on villages in Laos and Kampuchea. Pollen showed up in some samples. Killer pollen? "It's the perfect agent for dispersal of a toxin weapon," says Gary Crocker, a U. S. Department of State spokesman. "It's easily spread over a wide area." From 1975 through 1982, the U. S. claims, at least 7,000 people have died from chemical agents in Southeast Asia. The Soviets deny the allegation, and findings of a 1982 United Nations investigation were inconclusive. Since then, several U. S. scientists, including Dr. Meselson and Yale bee expert Dr. Tom Seeley, have attributed yellow rain to bee excrement. Their theory, bolstered by a trip to Thailand, rests on the fact that bees make defecation flights that can splatter large areas with yellow spots. The Smithsonian's Dr. Nowicke, who examined alleged yellow-rain samples under the scanning electron microscope, agrees that they are probably bee excrement.

But at last look, the State Department was sticking to its guns. The controversy continues, unabated, unresolved.



To harvest pollen, *a beekeeper in New Mexico inserts a wire trap at the hive entrance. When worker bees gather pollen as protein for larvae and return to the hive, they must squeeze through a mesh screen* ***(above)*** *that knocks the pollen off their hind legs. Falling to the bottom of the trap, the pollen collects on a drawer that is periodically emptied* ***(above right)****. The pollen is packaged and sold as health food. Devotees claim it gives athletes a competitive edge and promotes good health, though many scientists doubt such claims.*

Under the guidance of Bob Firman, president of Pollen Services, Inc., one of six agricultural pollen companies in this country, I swing a ten-pound mallet at the trunk. My first swipe misses, and I suffer an embarrassing wrench familiar to a golfer who whiffs the ball. A second swing brings a shower of pale white blossoms onto a tarpaulin beneath the trees.

Almonds are merely one species of about ten billion dollars' worth of crops pollinated by bees. As with apples and pears, almonds of like-variety trees are generally not self-fruitful. A Red Delicious apple tree, for example, cannot pollinate another. A different

variety, say, Golden Delicious, is needed nearby for pollination to occur.

Bees make it happen. They forage among blossoms for nectar and pollen—the main protein source for growing larvae. The pollen brushes off on the bees' body hairs. The bees comb their hairs and scrape the pollen into a saddlebag-like basket on the hind legs. Back in the hive the pollen is packed into the comb cells to feed larvae. In a year's time bees gather 80,000 tons of pollen in the United States. As the bee goes from flower to flower, pollen gets brushed onto the stigma; fertilization occurs.

But pollination can be a dicey business. Sometimes bees are not around where or when you want them. Bees can be fastidious about working conditions. They won't fly if it's too cold or raining. Sometimes pesticide spraying inadvertently kills colonies.

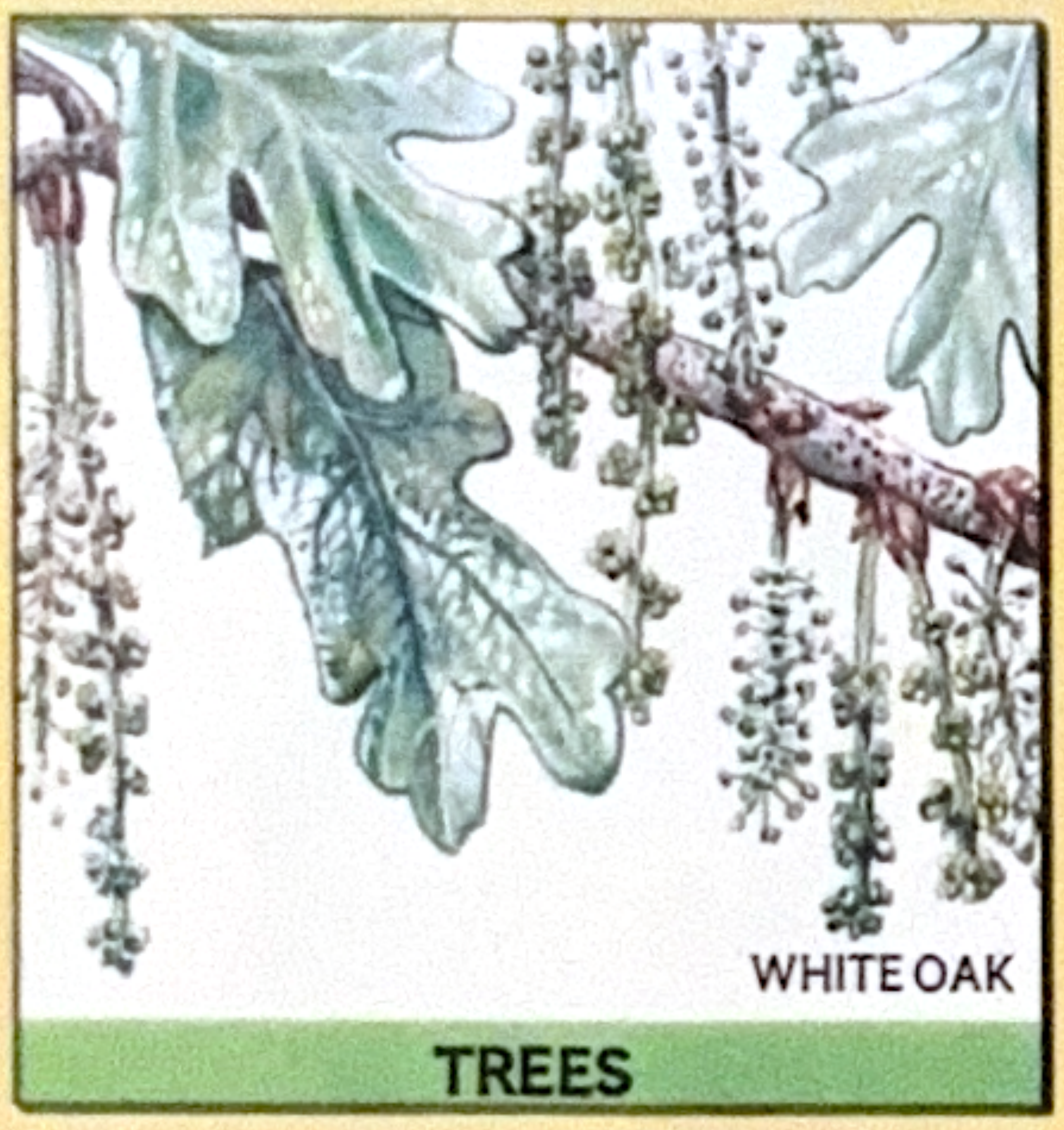
That sort of bad luck spells good luck to Bob Firman. He collects pollen from pears, apples, and almonds (one percent of the blossoms can be plucked without affecting the crop yield), processes it, then sells it to orchard growers. They apply the pollen to their trees by tractor sprayer or plane.

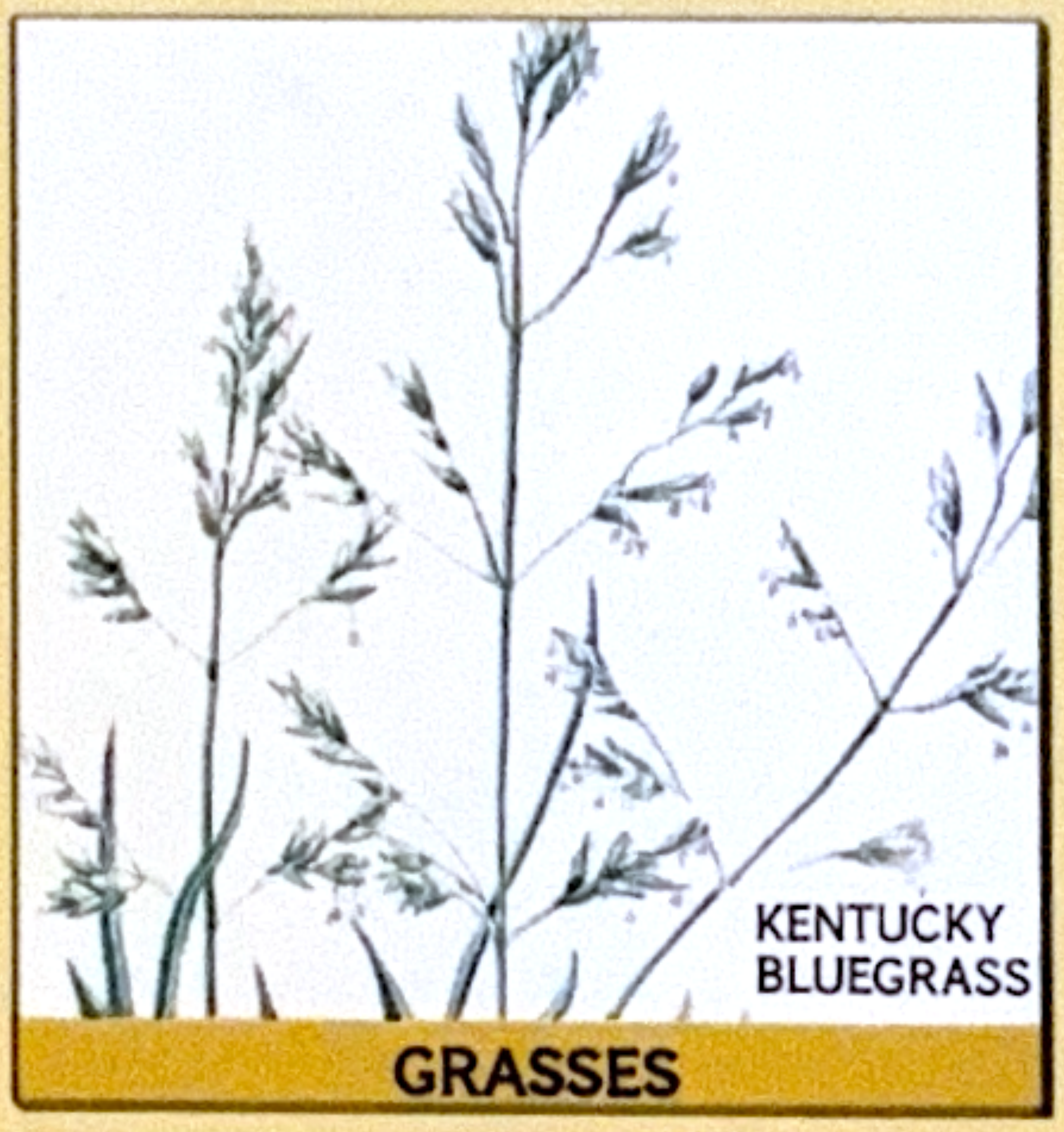
Bob and I stood in a barn and watched the kids dump bags of blossoms into a machine that separates pollen from petals. "It's very

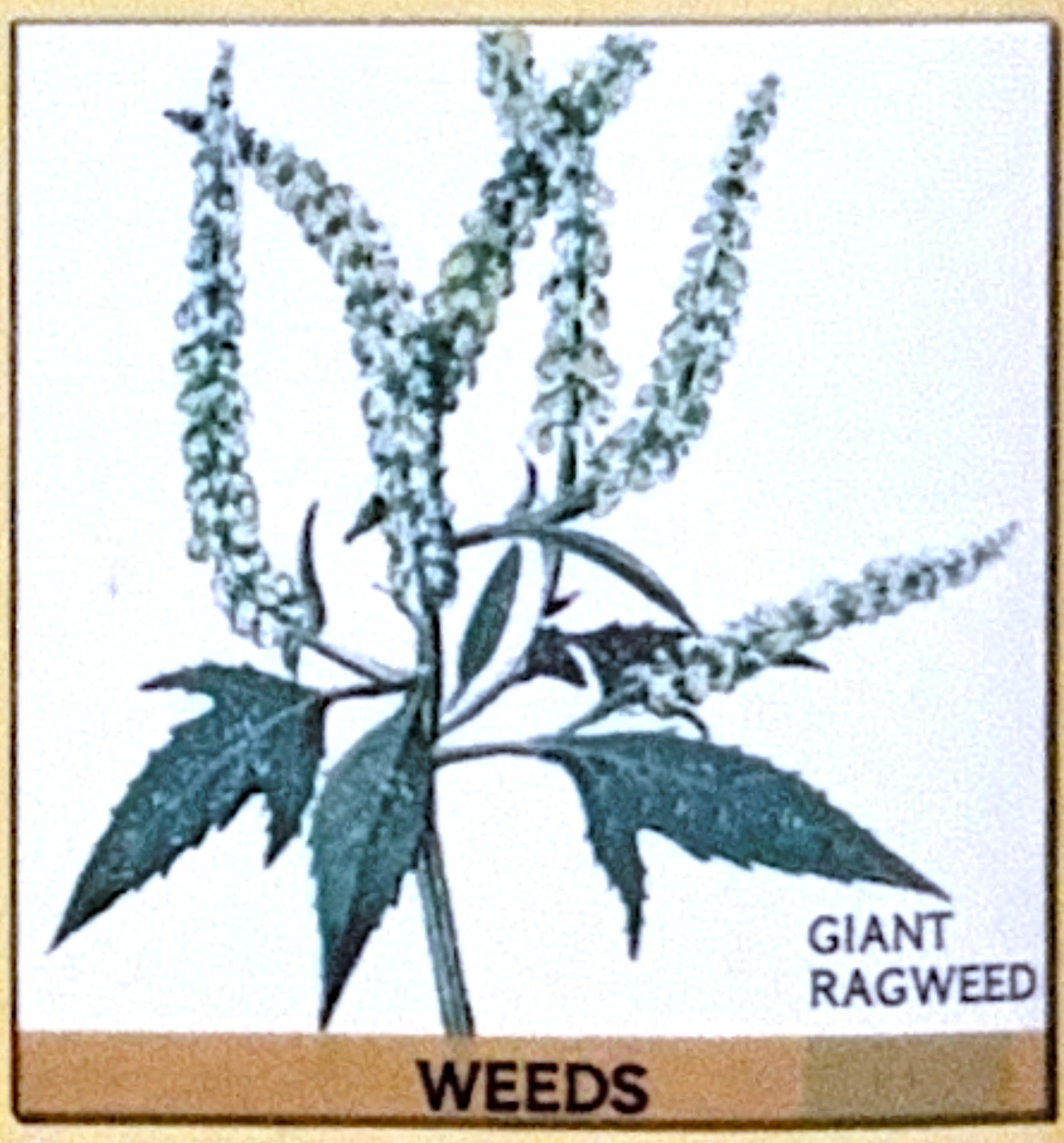
A MISERY INDEX

FOR THE HAY-FEVER CURSED there is no refuge, only respite. As this month-by-month chart shows, except for seasonal dormancy, most states have something pollinating sometime. Ragweed is the biggest troublemaker, with grasses close behind. But tree pollens, like those from oak and cedar, are notorious hay-fever culprits too. Ragweed blankets most of the country east of the Mississippi. Its prime time is late summer. Grasses cause trouble in summer, and trees in spring. But in other parts of the country, different weeds, trees, and grasses pollinate at different times of the year. And some states, like Texas, have vegetation that pollinates year-round.

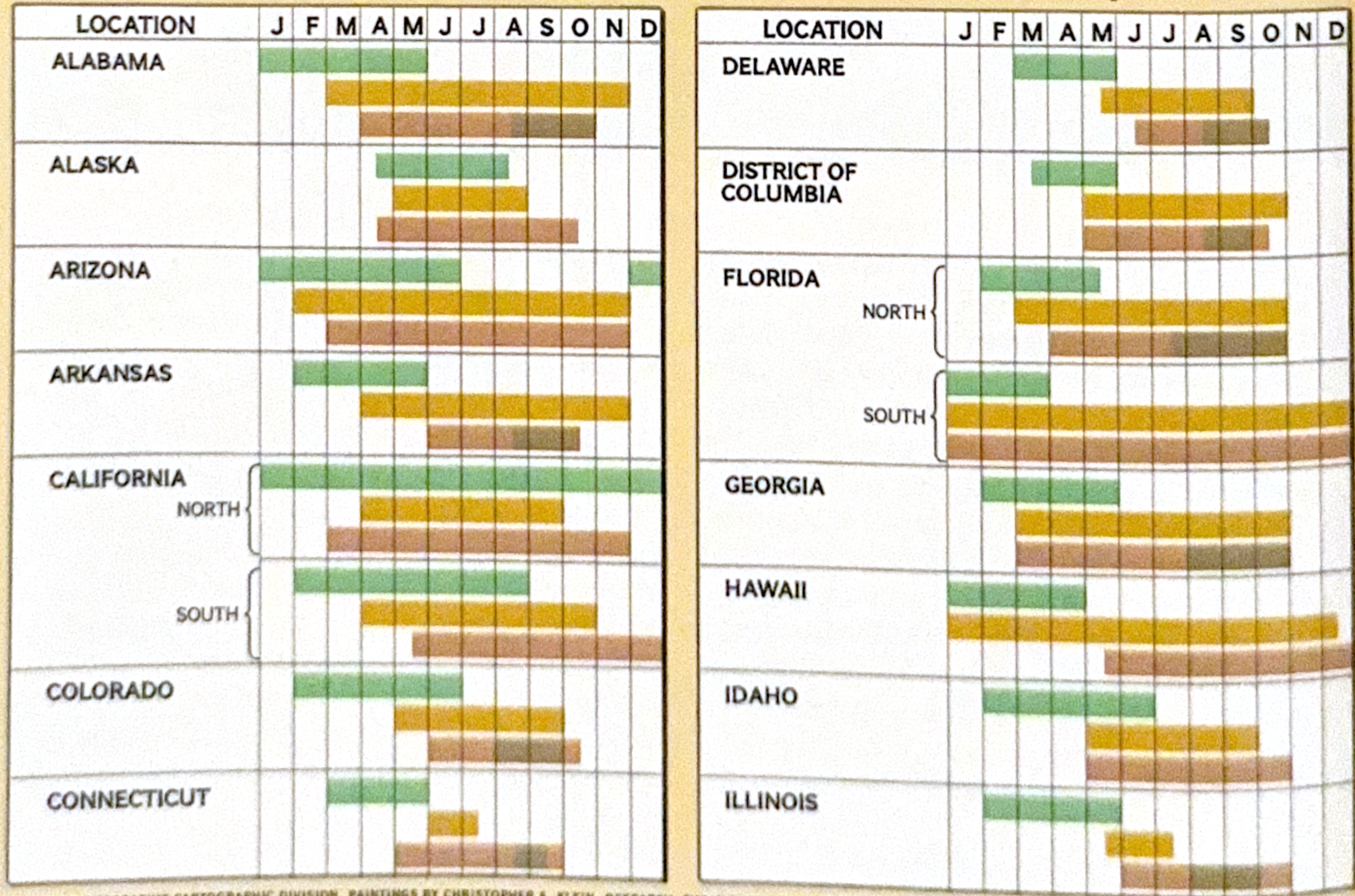
Furthermore, it may do no good for a ragweed-allergic person to move to a ragweed-less place like Portland, Oregon, or Juneau, Alaska. The body's immunological system can re-key itself and develop an allergy to plants those places do have. As noted Chicago allergist Dr. Max Samter wryly comments: "God takes care of allergists."







Darker brown indicates pollen season of short and giant ragweeds, considered the most prominent allergens in North America.



NATIONAL GEOGRAPHIC CARTOGRAPHIC DIVISION, PAINTINGS BY CHRISTOPHER A. KLEIN, RESEARCH: SUSAN B. MALCOLM, PRODUCTION: JAMES E. McCLELLAND

PRIMARY CONSULTANT: WALTER H. LEWIS, PROFESSOR OF BIOLOGY, WASHINGTON UNIVERSITY

CHART ADAPTED FROM SEASONAL ALLERGENIC POLLENS, PHARMACIA DIAGNOSTICS simple," he said. "No pollen, no almonds. If the weather conspires against the bees or throws off blossoming time, you might be left with a nice crop of leaves. There's not much of a market for leaves."

Suddenly, Bob paused, and sneezed. "Occupational hazard," he shrugged. And there is the rub. For all the blessings pollen strews in our paths, it also presents us with a giant bane: allergy.

Paradise lost: *Tucson, Arizona, once haven for hay-fever sufferers, now boasts an allergy prevalence three times the national average, largely because of such nonnative plants as mulberry trees (**facing page**). Desert pollens (**above**) from the Tucson area are, from left, winter mix, cottonwood, mistletoe mix, fan palm, creosote bush, amaranth, jojoba, summer mix, almond, sumac, and saguaro.*

NOW HERE was something to sneeze at! The jar beneath my nose held 525,325,000,000 grains of ragweed pollen—give or take a few thousand. Elizabeth White, director of Greer Laboratories in Lenoir, North Carolina, which turns such pollens into immunotherapeutic extracts—also called allergy shots—suddenly thought of a question she should ask. "You're not allergic, are you?"

Fortunately, like 13 out of 14 Americans, I am not.

With impunity, I sniffed and noted a grassy odor. Ragweed, the biggest seller of the 165 pollens Greer stocks, is not fussy. Scratch the poorest ground and it grows. And grows. Each year a quarter of a million tons of its pollen is launched into the air in this country.

Now suppose Mrs. White had held that jar under the nose of my allergic Tucson friend Bill Flynn. Bill's immunologic system is keyed to produce immunoglobulin E, an antibody that can be a hundred times more prevalent in the blood of the allergy afflicted. Once produced, the IgE molecules latch themselves to mast cells—cells that line the mucous membranes of the digestive and respiratory tracts. When an allergen like pollen arrives on the scene, it links IgE molecules and ignites a mini-explosion in the mast cell. Bam! Histamine and other chemicals leak out (diagram, pages 494-5). Bill Flynn sneezes, his eyes water, his nose drips. A sneeze is born.

A disease of sneezes and wheezes does not provoke the historical interest of say, Ludwig van Beethoven's deafness or Claude Monet's cataracts, so assessing hay fever's impact on the course of human events and accomplishments yields a scant, but interesting, harvest. President Richard Nixon is in the hay-fever league. So was French novelist Marcel Proust, who was so allergic to pollen that he sealed himself in his room, windows shuttered, curtains drawn. And so, reputedly, was Hippias, the Athenian traitor who guided the Persian invasion fleet at Marathon. In 490 B.C., while mustering troops after the landing, he coughed and sneezed so hard that a loose tooth sailed out of his mouth and into the sand. History held its breath while he dug around trying to retrieve it.

Those who dismiss hay fever as a minor affliction should consider its economic toll. In 1975 hay-fever-suffering Americans spent two million dollars on hospital care, 224 million in doctors' bills, and 297 million on drugs. But what about the physical toll?

An allergist advised me that to really appreciate the misery of hay fever, I should wear nose clips for a day.

The discomfort! I complained to him later. The feeling of pressure in my head, the inability to clear my ears. The annoyance of breathing through my mouth.

"That's just it," he nodded. "And at least you can take the clips off."

MY SYMPATHIES aroused, I searched for news of a cure. At the Johns Hopkins University in Baltimore I found Drs. Philip Norman and David Marsh experimenting with an altered form of ragweed pollen. Called an allergoid, it will require far fewer shots than current immunotherapy, in which increasing dosages of the offending allergen are injected on a weekly schedule and build up the immunoglobulin G antibody—an allergy-countering mechanism.

In La Jolla, California, I spoke with Dr. David Katz, who thinks his discovery of a suppressive factor of allergy will stop allergies in their molecular tracks. This suppressive factor in the blood (SFA, he calls it) operates as an on-off switch and can, he claims, block the allergic response. His company is manufacturing SFA using genetic-engineering techniques, and he expects to begin clinical trials early next year.

Ultimately, the answer seems focused on the realm of genetic tinkering. One day doctors will know how to identify those with a predisposition to allergy and how to turn off the mechanism that causes it.

An allergist in Washington, D. C., opened her drawer, and boxes of nose drops and pills spilled out. Some were antihistamines; they counter the congestion, nasal drip, and itching. Others were steroids; they suppress inflammation. Although such medications can control symptoms in the vast majority of people who suffer from hay fever, the sad truth remains: At present, no cure exists.

Looking for relief? You could leave town—at least during the major pollinating seasons of spring and fall.

Several years ago Dr. Harry Swartz, an allergist then living in New York City, proposed a hay-fever-sufferers cruise. The ship, staffed by a complement of nurses and doctors, would set sail for ragweed-free seas during the height of the season. The enterprise sank, though, when the travel operator backed out. "Too bad," Swartz said. "I'm sure it would have been tax deductible."

Name the hay-fever capital of the United States. Des Moines? Wichita? Newark?

Answer: They're all potentially bad. Or good. It depends on your allergy. If ragweed is your nemesis, compare ragweed samplings in September 1983 compiled by the American Academy of Allergy. The daily

A mirror image *of a saguaro cactus blossom* (**above**)*, viewed from a pair of binoculars on the ground, enables research entomologist Dr. Justin Schmidt and Diana Diaz* (**right**) *of the U. S. Department of Agriculture bee lab in Tucson to tally the number of flowers that open in May and June. The study explores the interrelationship between the plant and its bee pollinators.*

Blessed *by cattail pollen, Cora Knight (***above***) is showered with the powder during a coming-of-age rite celebrated by the White Mountain Apaches in Arizona. Pueblo and Navajo tribes also use pollen in ritual dances and healing ceremonies. "Pollen the beautiful is the force within us. It is a fit gift for the gods," the late Navajo medicine man Fred Stevens, Jr., told the author. Artist Wolfgang Laib sifts pollen through a sieve and shapes a rectangle (***right***) on the floor of his studio in West Germany. Laib's pieces last the duration of an exhibit, then are brushed into a jar. "The impermanence of my art doesn't matter," says Laib, who is internationally recognized in art circles. "The important thing is that pollen is eternal. It is the center of life."*

averages: Sarasota, Florida, 12 grains per cubic meter; Brooklyn, New York, 48; Boulder, Colorado, 173; Des Moines, Iowa, with the highest count, 407 grains.

Of course you could flee to Washington State, which has hardly any ragweed. There is a catch. Washington has its own crop of allergenic plants: dock weed, sagebrush, and wormwood, for example. A few years out there, and an allergy-prone person may be sneezing just as loud and long.

So how to get away from it all? At the height of Chicago's ragweed season I sat in the office of Dr. Max Samter, senior allergy and immunology consultant at Grant Hospital, and pondered the question on behalf of the sniffling patients who filed past.

"Well," suggested Dr. Samter, "if you don't mind penguins, you can always go to Antarctica."

You won't want to go to Arizona. Since the Sunbelt cinched a constricting band around the desert, pollen counts there have risen about tenfold in two decades.

"We used to have a shortage of allergists," said Harry Hayes, a medical technologist, who has kept a 30-year pollen-count record for the Tucson Clinic. "But not any more."

With Harry as guide I took a pollen tour of Tucson. Every street led us by an exotic, and problematic, pollen producer. Hayes rattled off their names: olive, privet, eucalyptus, cypress.

We passed vacant lots. "Look at the weed growth in those alleys. There's a big old canyon ragweed. I call it a sneeze weed."

We stopped at a mobile-home park. Hayes pointed to the neat, clipped yards. Each had a lawn . . . and a flowering mulberry tree.

The mulberry tree, an Asian native, gained notoriety three years ago when the Tucson city council tried to ban its planting on the grounds that it was a prolific pollen producer and a health hazard. The issue flared into a civic fuss. Why, some asked, pin all the blame on the mulberry? After all, Bermuda grass and olive trees were no more native to Tucson than mulberries; they produced hefty doses of pollen too.

For a time mulberry defenders prevailed. But last March the Pima County board mustered enough support from allergy sufferers to pass Ordinance 1984-29. No longer, it said, would mulberry trees be sold in the county. Furthermore, homeowners with Bermuda grass lawns now have to mow them often enough to prevent pollination.

IF POLLEN is a curse to some, it is a sacred blessing to others. In the Southwest, Pueblo and Apache tribes use it ceremonially—in puberty rites, at special dances, and at healing rituals. And to the Navajos pollen is the single most sacred item in the universe—a symbol of life, fertility, peace, and plenty.

The Navajo owner of a brand-new pickup truck, I was told, sprinkles pollen on the tires to bless it. Pollen even has value as barter. Patients unable to pay a medicine man cash can often pay in pollen.

"Corn pollen is a true thing. It is our life," the late Fred Stevens, Jr., a venerated medicine man in Chinle, Arizona, told me. "When a child is born, we feed it pollen, and it is in his spirit the rest of his life. At weddings it blesses the young couple. And when a man is dying, pollen is put on him too."

In a hogan by the mouth of the Canyon de Chelly, Fred Stevens placed a string of sky blue turquoise around his neck, tied a wisp of red cloth around his forehead, and began the Night Chant to cure a man who complained of lung congestion. Underscored by a gourd's hollow rattle, his wailing voice rose and fell. The patient, seated in the middle of a sand painting of two *yeis*, or ceremonial figures, joined in.

At the end of the ceremony Stevens took a pinch of pollen from a small deerskin pouch and flicked it in the air. Sunlight streamed through a hole in the roof of the hogan, illuminating the golden dust as it drifted down. Pollen had blessed the realm of human life once more.

Beauty and the bees *pair off in Lyvia Sylva's New York salon, where pollen-mask facials are touted as wrinkle therapy. Despite the controversy over pollen as a health and beauty formula, its known virtues remain unblemished. It ensures that grasses yield grain, trees bear fruit, and life continues in full flower.*